

Home Work

Level: 1st Year

Material: Fundamental Electronic 1

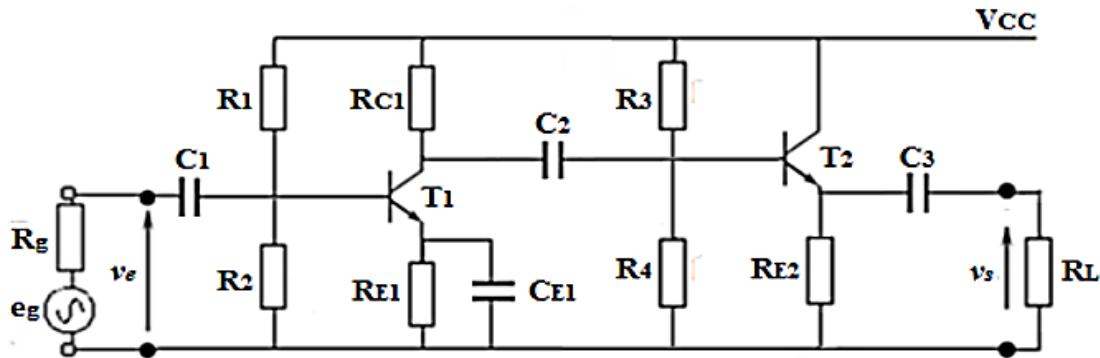
First Name and Last Name:

Group:

Deadline for this work is : Wednesday 7th May 2025

Exercise N°1

Consider the following amplifier circuit. The capacitors behave like short circuits under the operating frequency.



- 1- Draw the equivalent diagram for small variations of the circuit:

- 2- Give the expression for the input resistance R_{i2} of the T2 stage and its voltage gain A_{v2} .

3- Give the expression of the input resistance R_{i1} of stage T1 and its gain in voltage A_{v1} .

4- Give the expression of the input resistance R_i of the complete circuit and its gain in voltage A_v .

5- Give the expression for the output resistance R_{o1} of stage T1.

6- Give the expression of the output resistance R_o of the complete circuit.

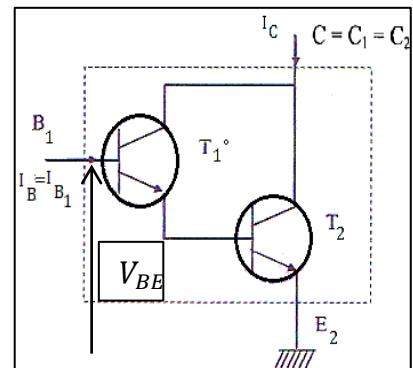
Exercise N°2

A-A Darlington circuit is made up of two bipolar transistors T1 and T2 (see figure). It works like a single equivalent transistor.

$$T_1 : \beta_1 = h_{21}, h_{12} = 0, h_{22}^{-1} = \infty$$

$$T_2 : \beta_2 = h'_{21}, h'_{12} = 0, h'^{-1}_{22} = \infty$$

- 1- Find the relationship between I_C and I_B .
 - 2- Determine β and the expression for V_{BE} .



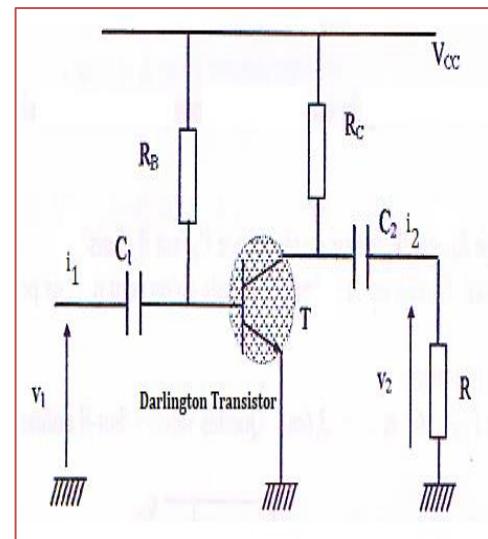
B- Dynamic Analysis of the circuit based on a Darlington Transistor:

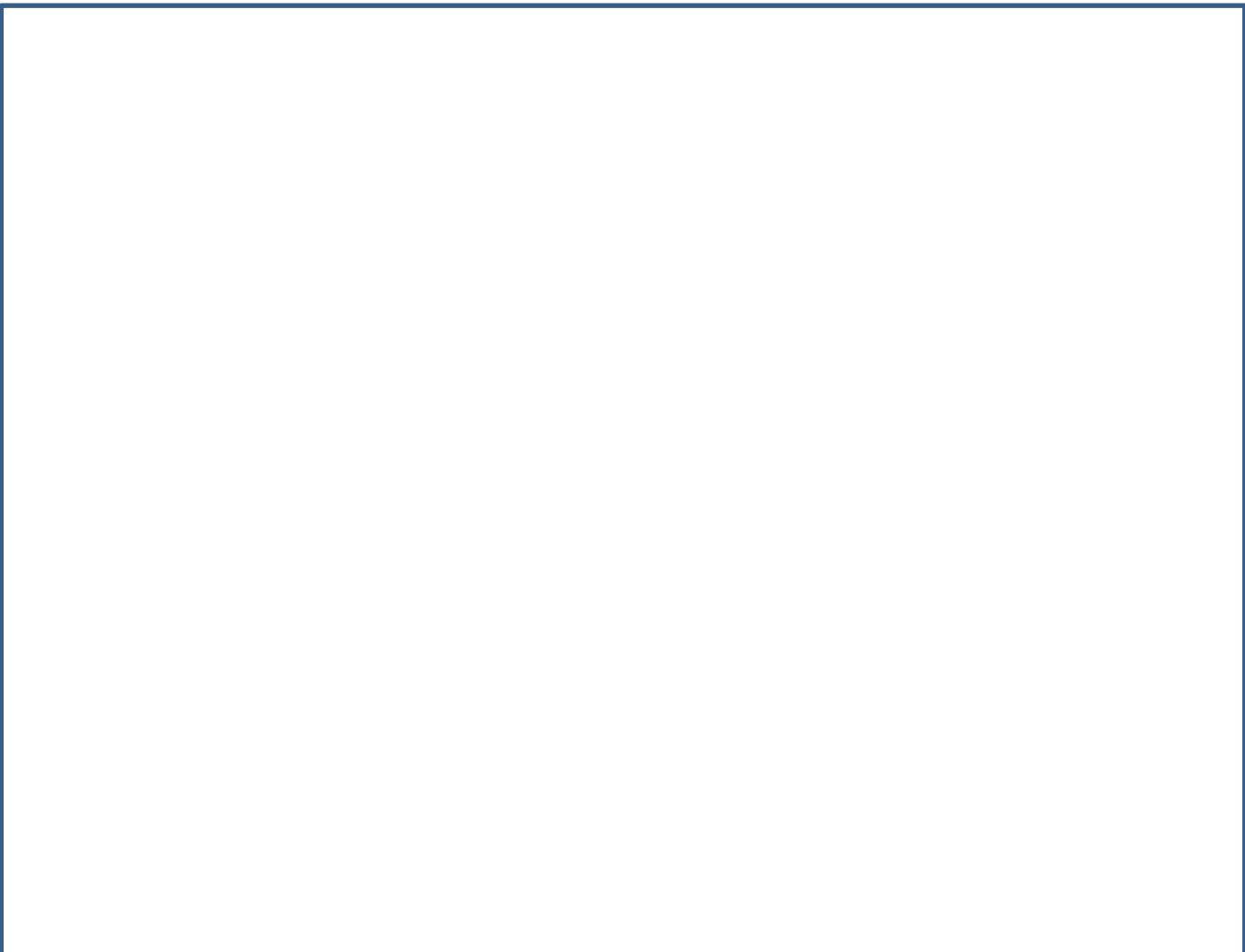
1. Draw the equivalent diagram for Darlington transistor and for the complete circuit in dynamic mode
 2. Calculate the input resistance of the circuit and deduced the expression of h_{11} of the Darlington transistor T.
 3. Calculate the amplifier current gain A_i

$$T_1 : r_1 = h_{11} = 1k\Omega, h_{21} = \beta_1 = 100, h_{12} = 0, h_{22}^{-1} = \infty$$

$$T_2 : r_2 = h'_{11} = 2k\Omega, \beta_2 = h'_{21} = 30, h'_{12} = 0, h'^{-1}_{22} = \infty$$

$$R_B = 4k\Omega \text{ and } R_C = 2.5k\Omega$$





Exercise N°3:

The circuits in figures (a) and (b) represent amplification based on field effect transistors. For each figure, determine:

1. The type of amplifier circuit
2. The equivalent dynamic diagram
3. Input impedance, output impedance, voltage gain and current gain (with numerical values).

Given that: $g_m = 3.33 \text{ mA/V}$, $\rho^{-1} = 0$, $R_D = 2k\Omega$, $R_S = 300\Omega$ and $R_1 = 4M\Omega$, $R_2 = 1M\Omega$

